. Favorable rock type

Known vein deposit containing silver-bearing tetrahedrite

Skarns that are contiguous to some plutons locally contain copper

Negative aeromagnetic anomaly interpreted as possible indication of hydrothermal alteration

Altered zones observed in field and on Landsat imagery

High molybdenum and copper in stream sediments

High values of molybdenum from altered zone

FOLIO OF THE McCARTHY QUADRANGLE, ALASKA

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Molybdenite occurs in discrete quartz veins or is associated with copper-molybdenum or molybdenum porphyry deposits in the quadrangle. The resource potential of molybdenum from the vein deposits is minor; however, some of the veins provide guides to nearby porphyry deposits. The porphyries, discussed in the copper section, represent the main molybdenum resource in the quadrangle and contain molybdenum as a potential byproduct. Some surface samples and samples of mineralized boulders on moraines of glaciers suggest that at least some of the deposits associated with upper Tertiary plutons are possibly molybdenum porphyries. Available information is not adequate to determine whether these porphyries

Silver-bearing deposits are known in host rocks that range in age from late Paleozoic to Tertiary. Except for byproduct silver in Kennecott and native copper types of deposits, we interpret the silver-bearing lodes as products of hydrothermal processes related to late stages of granitic plutonism. Silver occurs in minor amounts in many of the copper and gold veins already described and in more significant amounts in several zinc and silver veins (MacKevett, 1976b). Many of the porphyry copper, placer copper, and placer gold deposits are also known to contain silver in minor amounts. In the McCarthy quadrangle the most important type of deposit for silver, both with respect to past production and to undiscovered resources, is probably the Kennecott-type deposit. Past production from the major Kennecott-type deposits was about 9 million troy ounces of byproduct silver. On the basis of the estimated large number of Kennecott-type deposits that have not yet been discovered, the silver resources of the quadrangle are much larger than its past production.

Several other metals occur in the quadrangle (MacKevett, 1976b), and some are potentially of economic interest. Serpentinized alpine-type ultramafic rocks that form small outcrops along the northern flank of the Chugach Mountains (MacKevett, 1976a) may contain geochemically significant concentrations of nickel, chromium, copper, and by analogy with correlative ultramafic masses west of the quadrangle, platinum-group metals. The correlative ultramafic rocks include those at the Spirit Mountain nickel-copper prospect (Herreid, 1970; Kingston and Miller, 1945), an ultramafic complex near Spirit Mountain, and the Red Mountain ultramafic assemblage (Hoffman, 1972), all in nearby parts of the Valdez quadrangle. By analogy, the unprospected ultramafic rocks of the McCarthy quadrangle might contain

Other metals

Also of possible economic interest is the zinc that occurs in sphalerite associated with smaller amounts of galena in some deposits. These deposits form veins, disseminations, and small podlike masses in upper Paleozoic Skolai Group marble and schist and Triassic Nikolai Greenstone and Chitistone Limestone. Incomplete exploration indicates that some of the deposits have high zinc grades but small tonnages; further exploration might show that the tonnages are large enough to support small-scale mining.

Although the source is not known, the large magnetic anomaly in Tps. 1, 2 N., Rs. 23, 24 E. is of possible resource potential. As discussed by Case and MacKevett (1976), the size and intensity of the anomaly suggest that a large mass of strongly magnetic rock is concealed in this area.

NONMETALLIC COMMODITIES

Large quantities of limestone, sand, gravel, and rock suitable for various industrial and construction purposes exist in the quadrangle. Large volumes of carbonate rocks such as the Chitistone Limestone, the Permian limestone and marble, and the Kaskawulsh Group marble have high calcium carbonate and low silica contents. Sand, gravel, and rock are widespread in the quadrangle and have had limited use in local road building and similar construction. The economic significance of these nonmetallic commodities, however, depends largely on their proximity to large population centers where they are principally utilized. Hence, the economic potential of these commodities is low, and in the foreseeable future their exploitation will probably be limited to local highway construction needs and other local demands.

deposits of economic interest.

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EXPLANATION FOR GENERALIZED GEOLOGIC MAP (GEOLOGY GENERALIZED FROM MACKEVETT, 1976)

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS Qu UNCONSOLIDATED SEDIMENTARY DEPOSITS (Quaternary) SOUTH OF BORDER RANGES FAULT

METAMORPHIC ROCKS KJv VALDEZ GROUP (Cretaceous and Jurassic?)

Ti INTRUSIVE ROCKS (Eocene?) Typically, foliated granodiorite and tonalite

SEDIMENTARY, VOLCANIC, AND METAMORPHIC ROCKS QTw WRANGELL LAVA (Quaternary and Tertiary) Chiefly subaerial andesitic lava flows and tephra; includes local subaerial sedimentary rocks of the Frederika Formation K MARINE SEDIMENTARY ROCKS (Upper and Lower Cretaceous) Includes MacColl Ridge, Chititu, Moonshine Creek,

BETWEEN BORDER RANGES FAULT AND TOTSCHUNDA FAULT SYSTEM

JR MARINE SEDIMENTARY ROCKS (Jurassic and Triassic) Includes Root Glacier, Nizina Mountain, Lubbe Creek, and McCarthy Formations, Kotsina Conglomerate, and Nizina and Chitistone Limestones

Rn NIKOLAI GREENSTONE (Upper and (or) Middle Triassic) Mainly subaerial tholeiitic basalt; includes subordinate Chitistone Limestone north of Totschunda fault system

PIPs SKOLAI GROUP (Permain and Pennsylvanian) As mapped includes a few scattered remnants of Middle Triassic sedimentary rocks in northeastern part of quadrangle PIPsm METAMORPHOSED SKOLAI GROUP (Permain and Pennsylvanian) Includes a few small outcrops of serpentinized ultramafic rocks near Border Ranges fault

₽k KASKAWULSH GROUP OF KINDLE (1953) (Devonian?) INTRUSIVE ROCKS

Th | FELSIC HYPABYSSAL ROCKS (Pliocene) Mainly porphyritic dacite Tq GRANODIORITE (Pliocene) Unfoliated granodiorite with local mafic border facies

Jc CHITINA VALLEY BATHOLITH (Jurassic) Mainly foliated quartz monzodiorite, granodiorite, and tonalite

MONZONITIC-GRANITIC COMPLEX (Pennsylvanian) Mainly non-foliated quartz monzonite and granite, local mafic

Pgo GABBRO AND ORTHOGNEISS (Pennsylvanian)

NORTH OF TOTSCHUNDA FAULT SYSTEM SEDIMENTARY AND VOLCANIC ROCKS QTw WRANGELL LAVA See above

Kc | CHISANA FORMATION (Lower Cretaceous) Marine and subaerial volcaniclastic and volcanic rocks NUTZOTIN MOUNTAINS SEQUENCE (Lower Cretaceous and Upper Jurassic)

kn NIKOLAI GREENSTONE See above PIPs SKOLAI GROUP See above

INTRUSIVE ROCKS Th FELSIC HYPABYSSAL ROCKS See above Kkg KLEIN CREEK PLUTON (Cretaceous) Chiefly granodiorite

_____Contact-Dotted where concealed High-angle fault-Dotted where concealed Thrust fault-Sawteeth on upper plate. Dotted where concealed

NOTE: Areas without letter symbols are glaciers and snowfields

porphyry copper deposits, or gold-bearing skarns and are genetically related to Jurassic or Tertiary igneous activity he placer gold deposits are broadly distributed throughout the quadrangle and probably all of the drainage systems contain at least trace amounts of placer gold. The deposits are most abundant, however, in the Nizina River drainage basin; approximately 143,500 troy ounces of gold was produced from this basin prior to 1959 (Koschmann and Bergendahl 968, p. 14). Gold resources of the quadrangle include many placer-bearing streams and partly entrenched auriferous

esses of a few meters. Larger undiscovered native copper lodes could exis

90 percent \geq 60 million metric tons 90 percent \geq 0.10 percent copper

50 percent \ge 180 million metric tons 50 percent \ge 0.30 percent copper 10 percent > 500 million metric tons 10 percent \ge 0.55 percent copper

Known porphyry copper deposits

deposits (Richter, Singer, and Cox, 1975)

Small outcrops of favorable rock types

High molybdenum in panned concentrates

Aeromagnetic anomaly possibly from skarn

High copper in stream sediments

Strongly altered zones observed in field and on Landsat imagery

Local alteration effects observed in field and on Landsat imagery

Similar geologic environment to nearby parts of Nabesna quadrangle that contain porphyry copper

Negative aeromagnetic anomalies interpreted as possible indications of hydrothermal alteration

Known vein deposits containing gold, arsenic, and antimony, or gold, copper, and molybdenum

a. Known massive pyrrhotite deposit that contains minor chalcopyrite and gold and probably is of the

Aeromagnetic anomalies interpreted as possibly reflecting buried granodiorite rocks

GEOTHERMAL ENERGY

RADIOACTIVE MINERALS

 $\frac{1 \text{ deposit}}{18.4 \text{ km}^2} = \frac{\text{X deposits}}{520 \text{ km}^2 \text{ X 0.25}}$

Contact-metamorphic deposit

Known magnetite-bearing skarns with pyrite, pyrrhotite, and chalcopyrite

Copper and molybdenum anomalies in bedrock samples of sulfide-bearing Cretaceous granodiorite dikes that intrude Nutzotin Mountains Sequence (M. L. Silberman and D. P. Cox, written commun., 1976) Same rocks as those in Nabesna quadrangle that are known hosts for porphyry copper deposits

High copper and silver values in panned concentrates from stream sediment samples

Favorable rock type

Favorable rock types

gold production of the quadrangle, and it is unlikely that this situation will change in the future unless one or more gold-bearing porphyry copper deposits are found and mined. The lode deposits generally occur as veins, gold-bearing bench gravels, particularly those in the Nizina River drainage basin.